

PRELIMINARY REMARKS

In the Advisory Action dated 12/01/2010, the Examiner indicated that the data provided did show unexpected performance improvement, but the data was not commensurate in scope with the breadth of the claims. Hence, the claims remained rejected as obvious over Nakazato.

We present herewith additional data that demonstrates that the benefits of the present invention persist throughout the breadth of the claims as amended, and we provide some additional amendments to further specify the breadth of the claims. We therefore submit that the claims are now reasonably commensurate with the data.

In particular, as a result of the present amendments and those submitted on January 17, the claims now specify that the amount of (b) the nitrogen-free sulfurized olefin antiwear agent is 0.2 to about 1 percent; (c) the nitrogen-containing dispersant is a succinimide dispersant and its amount is about 2 to about 8 weight percent; and the lubricant formulation contains up to 0.07 percent phosphorus.

The Examiner's attention is now directed to the data submitted in the Declaration of Virginia Carrick, submitted herewith. Ms. Carrick's earlier declaration, of November 15, 2010, had demonstrated unexpected improvement in wear by using a sulfurized olefin (e.g., sulfurized carbobutoxycyclohexene) in place of oleyl amide from Nakazato (JP 2002-053888, US 6,569,818). The improvement was seen in relatively high sulfated ash formulations, but not at 0.56% ash, which is outside of the claims. The present Declaration demonstrates that this performance persists over the breadth of the claims, as amended.

In the current Declaration, Ms. Carrick demonstrates, in a baseline based on that of Nakazato, that the improvement in wear persists with a variety of sulfurized olefin species and at concentrations of 0.5% and 0.75%, but less apparently so at 0.15%. The improvement was not evidently observed in high phosphorus compositions (0.08% P). The claims have been accordingly limited in terms of the amount of sulfurized olefins and phosphorus.

The data from Table I of the current Declaration is summarized in Table I, below. For each test formulation, the same base oil and additive package was used as for example 12 of the November 2010 declaration, except for the specific type and amount of sulfurized olefin, and except that in examples F and G, additional zinc dialkyldithiophosphate was added to provide a higher phosphorus concentration.

Table I

	A*	B	C	D	E	F*	G*
Sulfurized olefin type:							
Sulfurized carbobutoxy cyclohexene, %	0.15	0.5	0.75			0.5	—
Sulfurized C ₁₂ -C ₁₈ olefins, %				0.5			
Sulfurized lard/veg. oils, %					0.5		
Succinimide dispersant, % (incl. 30% oil)	7 (i.e. 4.9% ^a)	7	7	7	7	7	7
Phosphorus, %	0.030	0.030	0.031	0.030	0.031	0.079	0.081
Sulfur, %	0.093	0.142	0.177	0.166	0.125	0.247	0.178
Sulfated ash, % (ASTM D 874)	1.05	1.00	1.05	1.05	1.04	1.11	1.12
HFRR wear scar, μm	183	155	158	181	164	206	209

* outside the present claims

a. That is, 4.9% active chemical, excluding the oil

The Examiner will recall that in the November declaration, Example 12 showed an improved wear scar of 136 μm , which was markedly better than the value of 210 μm for the formulation using oleyl amide (Ex. 11) as in Nakazato. In the data in the present declaration, each of Examples B through E similarly shows a low wear scar value of 155-181 μm . Example A, which used only 0.15% of the sulfurized olefin, although it still showed improvement over the value of 210 μm in the prior declaration, appears to be a borderline formulation, with a somewhat higher wear scar. The presently amended claims, specifying at least 0.2% of the sulfurized olefin, distinguish over that formulation. In Examples F and G, with a relatively high phosphorus concentration, the presence of the sulfurized olefin does not seem to have much effect. The presently amended claims, specifying “up to 0.07” percent phosphorus, similarly distinguish over those formulations. The various types of sulfurized olefin, in Examples B, D, and E, each provide a significant improvement over reference Example 11 of the previous declaration, although, not surprisingly, there are minor variations in performance among those materials.

Ms. Carrick also presents data in which the same comparisons were made in a different baseline formulation, in this instance, the formulation used in Ms. Carrick’s declaration of June 2010 (submitted July 2010). The Examiner will recall that the data in that declaration showed that 0.5% of the sulfurized olefins of Examples 7 and 8 gave HFRR wear scars significantly improved over the value of 242 for oleyl amide in Example 5. The present data in Table II, below, confirms that values in the 180-190 μm

range are obtained using the amounts and types of sulfurized olefins tested. As before, the formulation containing only 0.15% sulfurized olefin was borderline and is no longer covered by the amended claims. Likewise, the phosphorus formulations greater than 0.07 percent are excluded by the present claims, since little differentiation is shown at high P.

Table II

	H*	I	J	K	L	M*	N*
Sulfurized olefin type:							
Sulfurized carbobutoxy cyclohexene, %	0.15	0.5	0.75			0.5	—
Sulfurized C ₁₂ -C ₁₈ olefins, %				0.5			
Sulfurized lard/veg. oils, %					0.5		
Succinimide dispersant, % (incl. 50% oil)	7.2 (ie 3.6% ^a)	7.2	7.2	7.2	7.2	7.2	7.2
Phosphorus, %	0.050	0.049	0.048	0.048	0.049	0.077	0.077
Sulfur, %	0.177	0.223	0.255	0.246	0.207	0.281	0.215
Sulfated ash, % (ASTM D 874)	1.07	1.05	1.05	1.07	1.06	1.10	1.10
HFRR wear scar, μm	203	188	180	192	184	184	180

* outside the present claims

a. That is, 3.6% active chemical, excluding the oil

Therefore, it is submitted that the improvement brought about by the present invention has been demonstrated over a scope reasonably commensurate with that of the claims as amended. According, it is believed that the claims are novel, unobvious, and in condition for allowance.

Any required fees or any deficiency or overpayment in fees should be charged or credited to deposit account 12-2275 (The Lubrizol Corporation).

Respectfully submitted,

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